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ABSTRACT

Since attaining independence in 1960, Nigeria has attempted vigorous promotions of science education involving changes in curricula. This paper examines the impetus, nature, and impact of such curricular reforms at the post-secondary level. The historical context of these issues is provided. Issues necessitating reform and reform trends are discussed and the nature of current reforms is described. Two studies conducted in three Nigerian universities, to ascertain the perceptions of staff and undergraduates concerning the impact of reform are presented. For these studies, a total of 206 undergraduates and 15 lecturers randomly drawn from the Faculties of Science and Education were surveyed. In study 1, 86% of the students and 95% of the lecturers believed the new reform has not brought about appreciable improvement in the quality of instruction. The deplorable state of the laboratories and the lack of motivation of the lecturers were said to hinder the possibility of an improvement in the quality of instruction. The students (69.3%) and the lecturers (92.3%) hold the view that the reform has not led to an improvement in the attitude of students and has seen a lowering of course grades. In study 2, the Science Laboratory Environment Inventory was used. The students (86%) found their laboratories to be competitive in nature and far from conducive to learning science. Ninety-two percent wished the laboratories to be more structured. (PR)

CURRICULUM REFORMS IN POST-SECONDARY SCIENCE IN NIGERIA

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Introduction

Post-secondary education in Nigeria occurs after six years of primary education and six years of secondary schooling. The National Policy on Education regards post-secondary education as that which is offered mainly in the tertiary institutions - universities, polytechnics and colleges of education. Entry is gained into these institutions about the age of 18. There are 131 of such institutions serving a population of 88.5 million.

Science, in its pure and applied form, is a core component of the curricula of tertiary institutions in Nigeria. The strength of the science programme derives from government's policy of 60:40 admission ratio in favour of science-based disciplines for all higher institutions.

Since attaining independence in 1960, vigorous attempts have been made to promote science education. These attempts have involved changes in curricula. It is the impetus for, the nature and the impact of such curricular reforms at the post-secondary level that this paper examines. These issues are first set in a historical context.

Historical Perspective

The first institution of higher learning in Nigeria - the Yaba Higher College was established in 1934. Hitherto, post-secondary education in the form of vocational and sub-professional courses was given in agriculture at the central agricultural research station, Moore Plantation, Ibadan, and at Samaru near Zaria. In veterinary science at Vom in the Cattle area on the Jos Plateau and

in Engineering in Lagos by the Nigerian Railway Company and the government technical departments (Taiwo, 1981).

The Yaba Higher College was formally opened in January 19, 1934. It had a capacity for 100 students and it aimed at satisfying the intermediary manpower needs of the country in engineering, medicine, teacher training for secondary schools, agriculture, survey and forestry. The Yaba Courses were therefore mainly science, pure and applied.

Post-secondary education received a boost following the submission of the Asquith and the Elliot Commission's reports in 1943. In August 1943, the Asquith commission was appointed to "consider the principles which guide the promotion of higher education, learning and research and the development of universities in the colonies."

The reports of both commissions led to the transfer of the Yaba Higher College to Ibadan to form the nucleus for the establishment of the University College, Ibadan in 1948. The curricula of the university college was largely science oriented. Sixty eight of the 104 foundation students were enroled for science (-physics, chemistry, mathematics, botany and zoology) and medicine.

The Ashby Report of 1960 led to the establishment in 1962 of Ahmadu Bello University, Zaria and the University of Lagos. The University of Nigeria, Nsukka and the University of Ife, Ile-Ife (now Obafemi Awolowo University) also came about in 1960 and 1962 respectively, as a result of Eastern and Western regional aspirations for universities. Also in the 60s, a number of advanced teachers colleges and polytechnics were established to complemer the efforts of the universities. The 70s saw the establishment of what is regarded as the second generation universities and the 80s the third. These institutions and indeed all post-secondary schools from independence had a respectable

amount of science in their curricula. These curricula have undergone reforms over the years in response to a number of issues.

Issues necessitating reform and reform trends

One of the early influences was the wave of curricular reforms of the sixties in the U.S. and Britain which also caught on in Nigeria. Remarkable influence was exerted by this worldwide trend on secondary and tertiary-level science. Emphasis began to shift from the hard core content-oriented programmes of the higher institutions to a more process and inquiry-oriented curricula. The "Science for discovery" and "Science as enquiry" buzz words also crept into the vocabulary of the science curricula in our higher institutions.

A shift from the "traditional" to the "discovery" mode was slow in coming, however. The inertia that is characteristic of change especially by the lecturers who were deeply set in the British tradition was important in the slow pace of change. The increase in the number of American - trained staff facilitated change in the 70s.

Another major issue necessitating reform is the need to break away from the tradition of the British science curricula. By virtue of the British colonial heritage, the curricula of the post-secondary schools in Nigeria were patterned largely after those of the tertiary institutions in Britain. Between 1960 and 1961 efforts were made to carve out a new curricular identity. The American model was considered attractive.

The course-unit system basically an American model, slowly emerged as the pattern for programmes in higher institutions. This saw a switch from the 3 - term yearly calendar and a one - shot end-of-year examination, to a 2-semester arrangement with continuous assessment component. Other features of this reform in the area of science include:

- de-emphasis on British examples and focus on local examples especially in the life sciences;
- specification of instructional objectives and their mode of assessments;
- clear explication of course content;
- emphasis on project work and practicals.

Another factor of note is the emerging demand for new knowledge and skills. The flourishing of the brewery industry in the mid-seventies for instance, demanded that many more microbiologists be trained. In response, universities mounted courses leading to the award of bachelor's degree in microbiology and specialization at the higher degree level in brewing science. The petroleum industry also needed engineers and geologists. Apart from the boost to the degree programmes in these disciplines, the basic science curricula had to be modified to cater for the different groups of students. Consequently, the 100 - level science courses had to be broadened in scope.

Science curricular reforms also came about by the factor of minimum standard specification. Two Commissions and a Board were particularly instrumental in this regard. These are the National Universities Commission (NUC) for the universities; the National Board for Technical Education (NBTE) - for the Polytechnics; and the National Commission for Colleges of Education (NCCE) for the colleges of education. The three agencies using experts from the different groups of institutions formulated programme scope and structure that must be met for course acreditation. This was a major force in science curricular reform in Nigerian higher institutions especially in the 80s. Every university, polytechnic or college of education aspiring towards science programme accreditation, reworked their science courses to fix the minimum specification.

The reform in the science curricula was also in response to large classes and the change from a 5 - year to a 6 - year secondary education. From the mid 70s, the science classes have recorded astronomical growth. Large classes are not predisposing to the conduct of practicals. In consequence, the science curricula have been modified to cut down on the practicals component. The concept of "theory of practicals" was introduced.

Theory of practicals does not involve laboratory work. Instead, the conceptual or theoretical basis for standard laboratory experiments are described in class - students are left to imagine how the experiment would run if the equipment and materials were available.

The need to deliver science education at a distance also led to the institutionalization of reforms resulting in the establishment of distance education delivery systems. This was fostered by the growing students' population and the inability of many of such students to undertake regular classes in science owing to factors of convenience and economy. The National Teachers Institute and the University of Abuja have shown leadership in this activity.

Nature of Current Reforms

There is a perceptible shift towards the harmonization of course offerings in science in post-secondary institutions in Nigeria. The minimum standard specification of the NUC, NBTE and NCCE has been a key factor in this shift. Core courses in science and science education offered under different codes have basically the same content across institutions. The current reform, therefore, is aimed at a unity in program package for post- secondary schools.

In promoting unity in the core content of programs, the current reform is ensuring comparability of standards. The 'model' programm package is based

on national aspirations in science and technology. The reform, in essence, makes it possible for all higher institutions to contribute towards the achievement of national goals as stated in the National Policy for Science and Technology.

A spiral structure of curriculum packaging is favored by the current reform. Courses are partitioned into levels. At each of the 100 to 400 level of the degree program in science, a student is expected to study bits of a particular block. For example, inorganic chemistry, organic chemistry, ecology, physiology and genetics are regarded as course blocks. The content of each block for a degree program is split more or less into four (sometimes two) and sequenced for difficulty and scope. These components are assigned to different levels (100 to 400) of the degree program. The 100-level components are basic and broad in scope. The 400-level components are more specialized and more mentally demanding.

Continuous assessment is an aspect of the reform that merits mention. It is a practice that is expected to be systematic, comprehensive, cumulative and guidance oriented. Every course is expected to be assessed by two modes - continuous assessment (C.A.) and end-of-course examination. The C.A. mode takes a minimum of 30% of the grade for the course. For practical courses in science, C.A takes 70%. The tests, quizzes, projects or assignments that form part of the C.A. are given at least thrice during a 15-week semester.

It is anticipated that the C.A. in the sciences should be largely based on projects and laboratory work. This, unfortunately, is not the case. Continuous assessment is mainly through essay-type tests of the short-answer variety on some content area in the course. Two things may be accountable for this. One of these is the existence of purely 'practical' and 'theory' courses. Thus, practical tests are underplayed in the purely 'theory' courses. The other factor is the

shortage of equipment and materials for the conduct of laboratory sessions, and of course, practical tests, as part of the C.A. procedure.

Impact of the Reform

Study 1

A survey was conducted in three universities in Lagos and Ogun states of Nigeria to find out the perceptions of staff and students of the impact of the new reform in science education. Data were collected as part of a larger study for Master's theses by two research assistants under supervision by one of the authors.

Sample: Two hundred and six undergraduates (100 to 400-level) and fifteen lecturers randomly drawn from the Fcaulties of Science and education from the three universities took part in the survey.

Instrument and Procedure: A 2-part validated questionnaire was used for collecting data. While the first part of this instrument sought demographic information, the second part sought the views of the respondent on the impact of the new reform on (a) quality of science instruction; and (b) performance of students in science in the areas of attitude and skills development. The instrument was administered at convenient times by the research assistants to students and lecturers in the sample.

Major findings

* Eight-six per cent of the students in the sample and 95% of the lecturers believed that the new reform has npot brought about appreciable improvement in the quality of science instruction. The deplorable state of the laboratories and the lack of motivation of the lecturers were said to hinder the possibility of an improvement in the quality of instruction.

* The students (69.3%) and the lecturers (92.3%) hold the view that the reform has not led to an improvement in the attitude of students to science and has seen a lowering in their course grades.

* The lecturers (59%) found the new program to be supportive of indigenous authorship of science texts.

* Ninety-one per cent of the lecturers and 89% of the students held the view that the new program encourages better study habits.

Study 2

The aim of this study was to find out the perception of the preferred and actual laboratory environments of students operating the new science curriculum.

Instrument: The Science Laboratory Environment Inventory (SLEI), developed and validated for the Nigerian school system by Fraser, Okebukola & Jegede (1992) was used for data collection.

Major findings

* The students (86%) found their laboratories (actual) to be competitive and far from conducive for learning science.

* Ninety-two per cent wished (preferred) the laboratories to be more structured.

Conclusion

On the face value, the current curricular reforms in post- secondary science in Nigeria are in a direction leading to an improvement in the science and technology capacity of the country. The reform within the university system as the findings of the two reported studies show, are not in agreement with this

expectation. If the twin issues of acute facilities shortage and brain drain are tackled, perhaps the goals of the reforms would be realized.

The reforms are cast within a framework of adequate laboratory facilities and staffing. The implementation, however, is within a context that is ad contra to this framework. The poor shape of the country's economy is making it increasingly difficult to provide the basic materials for laboratory work. The exodus of teaching staff to other countries is seriously depleting the staff pool. The option that is available now is for new reforms to be initiated that will recognise the existence of facilities shortage and the drastic reduction in the number of staff who can implement such curricula.

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